

N85-32446

# STATUS OF HIGH-EFFICIENCY MODULE DESIGN AND FABRICATION

SPIRE CORP.

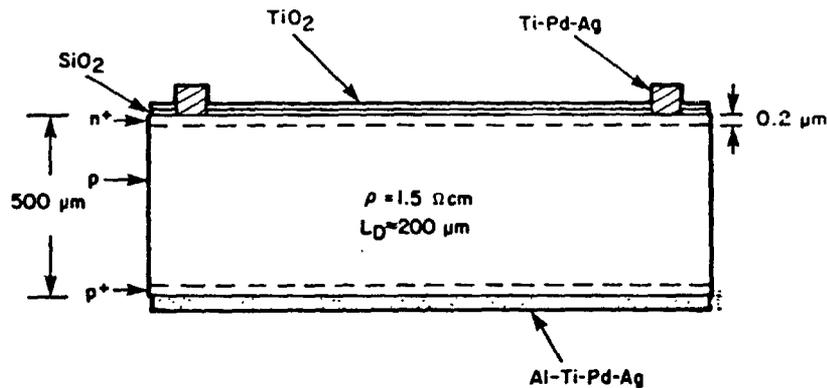
M.B. Spitzer

## Objective

FABRICATION OF HIGH EFFICIENCY MODULES  
( $\eta > 13\%$  at NOCT) WITH EMPHASIS ON REDUCED  
OPERATING TEMPERATURE.

REDUCTION OF NOCT IMPROVES BOTH  
EFFICIENCY AND MODULE LIFETIME.

## Cell Design

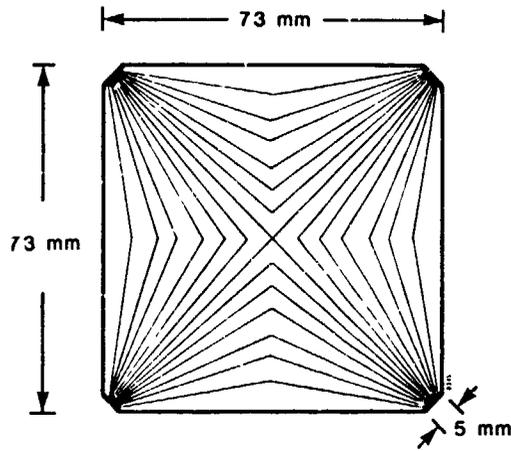


- AI USED FOR BSR
- SiO<sub>2</sub> USED TO PASSIVATE SURFACE
- p<sup>+</sup> SIMPLE OHMIC CONTACT (NOT BSF)
- NO EDGE PASSIVATION USED

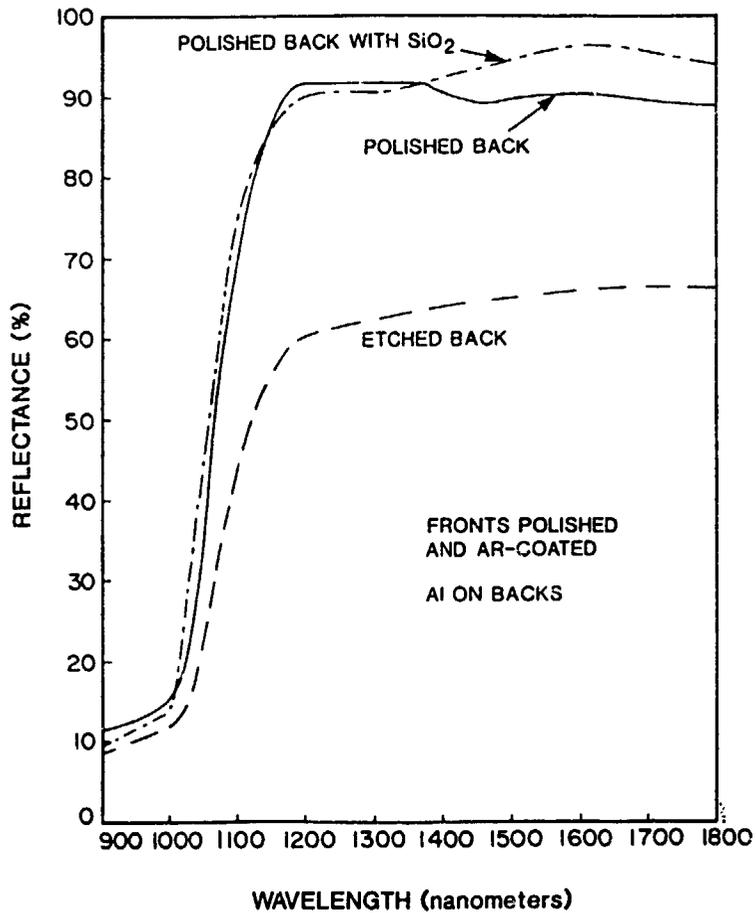
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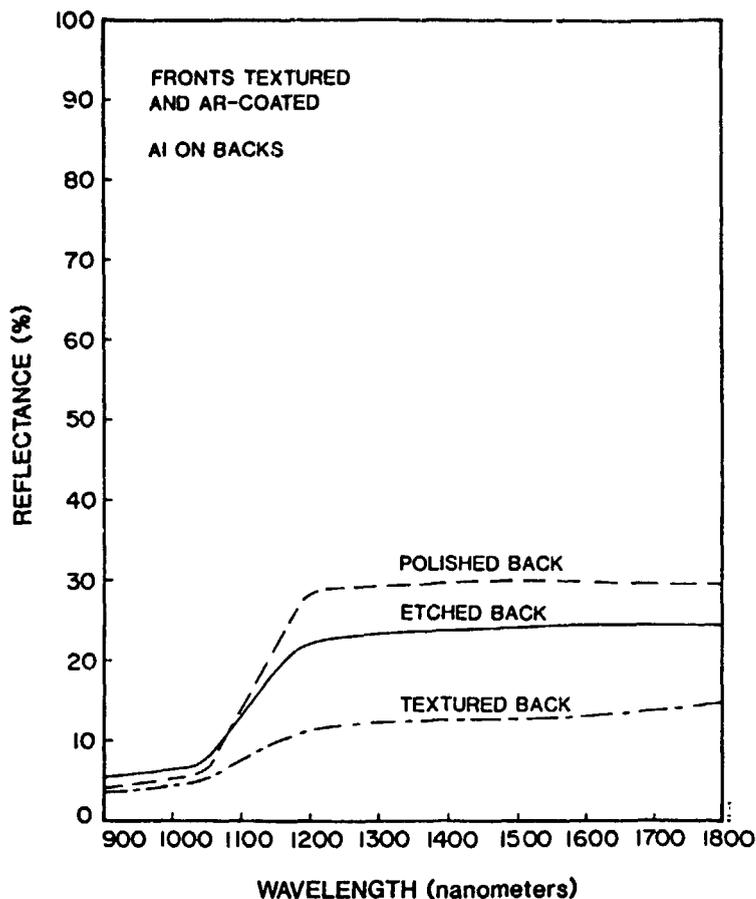
## Illustration of the Cell Design



CELL AREA: 53.04 cm<sup>2</sup>  
SHADOW LOSS: 5%  
LINE WIDTH: 20 μm



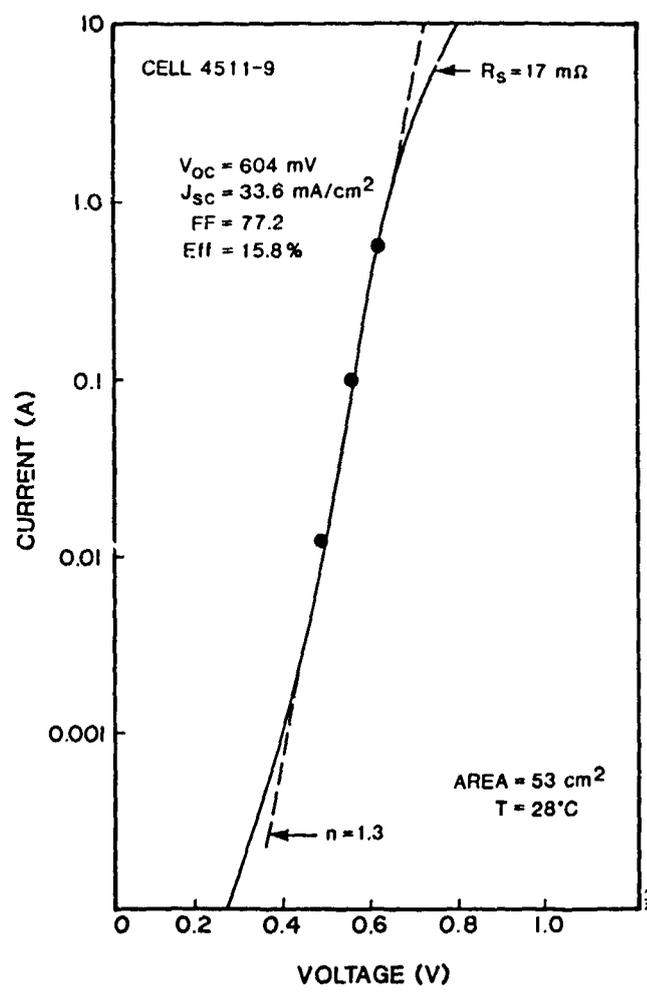
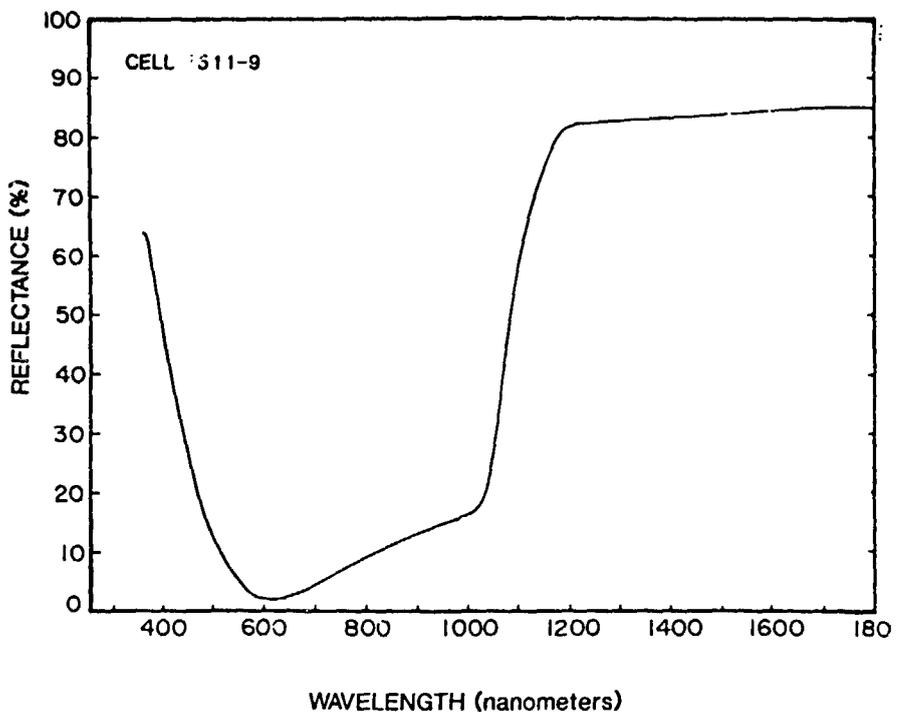
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### Summary of Reflectance Data

SURFACES		BACK METAL	DIELECTRIC	R	R
FRONT	BACK			(1200 nm)	(1400 nm)
POL	POL	Al	SILOX	0.90	0.94
POL	POL	Al	NONE	0.92	0.90
POL	POL	Ti	SILOX	0.55	0.28
POL	POL	Ti	NONE	0.30	0.02
TEX	POL	Al	SILOX	0.41	0.39
TEX	POL	Al	NONE	0.22	0.24
TEX	TEX	Al	SILOX	0.36	0.34
TEX	TEX	Al	NONE	0.12	0.13

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### Performance Data for 10 Deliverable Cells

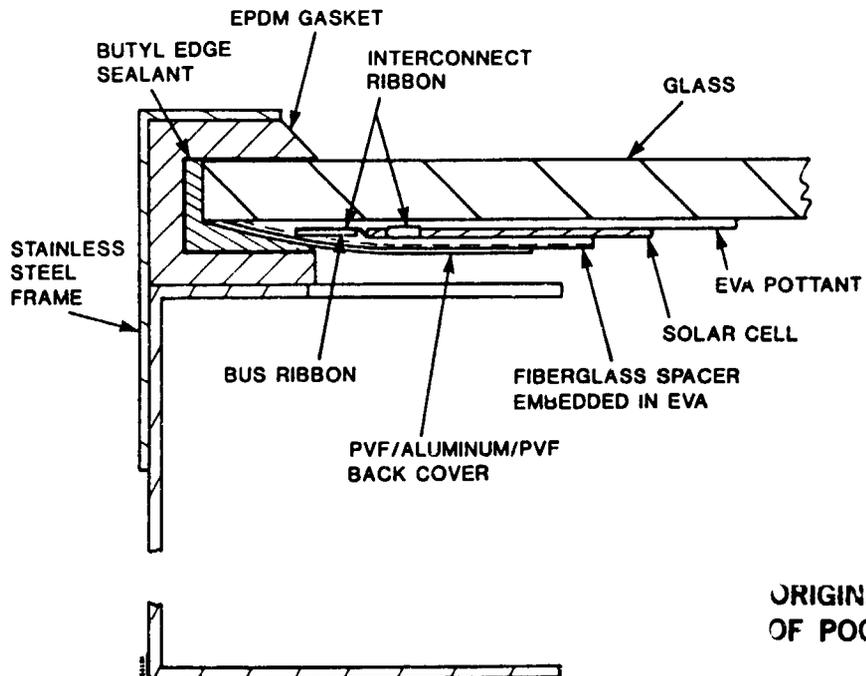
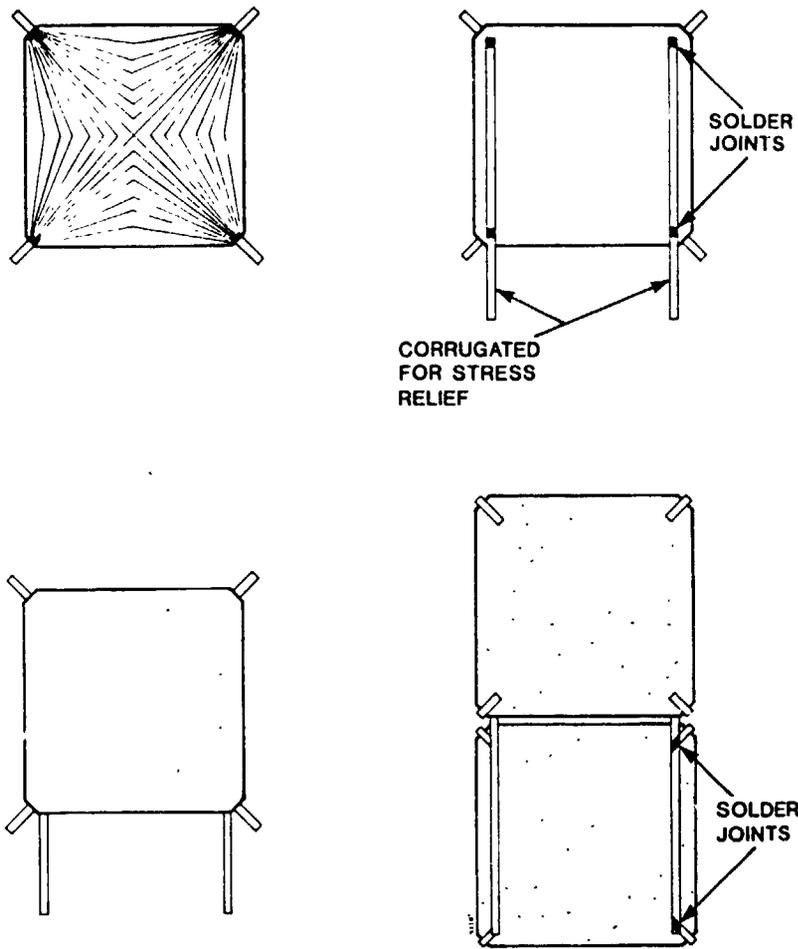
CELL	V <sub>oc</sub> (mV)	J <sub>sc</sub> (mA/cm <sup>2</sup> )	FF (%)	EFF (%)
1	607	33.5	74.8	15.2
2	604	33.3	76.8	15.4
3	604	33.4	74.4	15.0
4	607	33.2	77.6	15.6
5	604	33.3	78.2	15.7
6	604	33.0	77.3	15.4
7	607	33.4	76.8	15.6
8	609	33.5	77.3	15.8
9	609	33.6	77.2	15.8
10	601	33.7	76.9	15.6

NOTES: INSOLATION WAS AM1.5, 100 mW/cm<sup>2</sup>. T=28°C.  
AREA=53 cm<sup>2</sup>.

### Possible Efficiency-Improving Features

- TEXTURE SURFACES - INCREASES J<sub>sc</sub> BUT ALSO RAISES NOCT.
- THINNER WAFER - REDUCES J<sub>0B</sub> BUT ALSO REDUCES YIELD.
- REDUCE RESISTIVITY - REDUCES J<sub>0B</sub> BUT ALSO J<sub>sc</sub>.

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